

Smart Scale Energy Solutions Waste Water Treatment Plants

Optimize energy consumption and don't flush money away



Benefits

Analyzing the performance of the treatment plant helps you to:

- Benchmark efficiency of treatment plants compared to similar systems
- Track energy usage and determine the cost of Waste water treatment
- Improve image and position with agencies or rate payer
- Evaluate equipment, system and control performance
- Quantify benefits of system modifications and improvements
- Verify predicted performance

Operators and owner of Waste Water Treatment Plants are under increasing pressure to provide reliable and save performance at level or decreasing costs. Especially the increasing costs for energy concern the plant operators. Typically treatment plants have a high potential for energy savings. Precondition for effective measures is the knowledge about the process characteristics of the individual plant sections.

The Challenge Even though the basic design of treatment plants is principally similar, all plants are custom engineered systems. Thus it requires individual analysis of sections and respective processes and their interaction to evaluate the current plant efficiency and identify improvement opportunities.

The Solution Define the right KPIs to evaluate the performance of the plant, for example

1. Aeration performance/efficiency
2. Pump efficiency
3. Power production efficiency (CHP)

1. Aeration Efficiency

In many plants 50 % of the electricity consumption is used to run the aeration system. According studies the pressure loss is typically up to 100 % higher compared to initial conditions, equal to 12 % higher energy cost. Apart from that, blower efficiency is typically unknown.

Monitoring of pressure drop, air flow and power consumption allows you to evaluate

- Blower performance (sizing, wear and tear, ideal point of operation)
- Pollution of aeration elements and required cleaning indicated by alarm ("in-time" maintenance)
- "Success" of the aeration control strategy.

Moreover pressure monitoring is essential for the plant safety (e.g. no blower overload or damage of aeration elements).

2. Pump Efficiency

Pumps are often oversized or operate not at their ideal point of operation. KPI benchmarking based on electricity consumption, flow and pressure is useful to discover weak performance

and maintain pumps in-time.
Example: Centrifugal pumps require regular impeller wheel adjustment to avoid significant efficiency loss.

3. Electricity Production

An increase of electricity production is mostly easier to achieve and less expensive than electricity savings measures. KPIs like gas to COD ratio or electrical and thermal efficiency of CHPs are essential parameters for optimizing and verification of electricity production or quantifying effects of co-fermentation.

In this context it has to be pointed out that it is necessary to focus not only on single processes but to monitor the whole system so that interaction effects can be discovered. Example: Co-fermentation increase gas production but decrease plant efficiency (KWh/kg COD) due to additional load. This must also be kept in mind when it comes to realization and verification of energy saving measures (potential savings cannot simply be added.)

Energy Management

The transparent allocation of energy usage of specific areas and processes is one of the key factors for energy management systems and precondition for benchmarking with other plants (KPI target values, e.g. DWA-216). Based on this data optimization measures can be defined and their success verified.

Apart from basic KPIs a set of further indicators can be calculated to analyze individual processes or sections, e.g. heat demand of digestion tower or service building, electrical self supply

rate or specific energy consumption sludge dehydration.

Memograph M analysis The energy manager Memograph M collects, stores and displays all the data required for the monitoring of treatment plants. By using the intuitive Field Data Manager software (FDM) it can be accessed from the desk and processed into a user friendly and meaningful format. In contrast simplified “annual value” solutions which are based on annual values actual, daily, monthly data are available and fast (in time) energy or process optimization is possible.



Memograph M with process display

System performance and trends:

- Plant performance
- Pump efficiency
- CHP efficiency
- Aeration performance
- Process specific SEC values

On Site The transparent energy data are the key for meaningful energy management of treatment plants and useful for operators and decision makers or public authorities.

✓ Payback Calculation Example:

Situation:

- Plant Size: 40,000 PE
- Aeration energy: 16 kWh/PE*a
- Air pressure: 50 kPa

Sources of energy loss:

- Pressure loss actual (clogged aeration elements): 13 kPa
- Pressure loss of clean elements: 2 kPa
- Ideal point of cleaning: 5 kPa

Payback:

Costs of instruments for aeration efficiency monitoring: 4,100 €

Electricity costs: 0.15 € / kWh

Amount of avoidable energy loss
 $(50-13)/(50-2)*100 = 23 \%$
 $16 \text{ (KWh/PE*a)} * 40,000 \text{ PE} * 0,23 = 140,800 \text{ kWh}$

Savings:

$147,200 \text{ kWh} * 0.15 \text{ €} = 22,080 \text{ €/a}$

$4,100 \text{ €} / 22,080 \text{ €} = 0.2 \text{ years}$

A just in time maintenance by pressure monitoring saves money, in this example 1,840 € /month

! The payback time is less than 3 months